

50X1

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

This Document contains information affecting the National Defense of the United States, within the meaning of Title 18, Sections 793 and 794, of the U.S. Code, as amended. Its transmission or revelation of its contents to or receipt by an unauthorized person is prohibited by law. The reproduction of this form is prohibited.

CONFIDENTIAL

COUNTRY	USSR (Moscow Oblast)	REPORT	
SUBJECT	Missile Research at Zavod 456, Khimki	DATE DISTR.	10 March 1954
		NO. OF PAGES	7 50X1-HUM
DATE OF INFO.			
PLACE ACQUIRED			

THE SOURCE EVALUATIONS IN THIS REPORT ARE DEFINITIVE.
THE APPRAISAL OF CONTENT IS TENTATIVE.
(FOR KEY SEE REVERSE)

50X1-HUM

CONFIDENTIAL

STATE	#X	ARMY	#X	NAVY	#X	AIR	#X	FBI		AEC							
-------	----	------	----	------	----	-----	----	-----	--	-----	--	--	--	--	--	--	--

(Note: Washington Distribution Indicated By "X"; Field Distribution By "#")

50X1

50X1

C O N F I D E N T I A L

REPORT

50X1-HUM

COUNTRY : USSR

DATE DISTR. 27 JAN 53

SUBJECT : Missile Research at Zavod 456, Khimki

NO. OF PAGES 6

PLACE
ACQUIREDNO. OF ENCLS.
(LISTED BELOW)DATE
ACQUIREDSUPPLEMENT TO
REPORT NO. 50X1-HUM

DATE OF IN

THIS IS UNEVALUATED INFORMATION

50X1-HUM

PREPARATION FOR MASS PRODUCTION OF V-2 MISSILE THRUST UNITS

1. I spent twenty months [] in the Special Development Department at Zavod 456, Khimki. During the first eight months I worked with a group of [] Germans engaged in training Soviet technicians in the work of checking and assembling V-2 thrust unit parts as well as assembling complete V-2 thrust units. The manufacture of parts using jigs and testing equipment brought from Germany was also demonstrated. Missing jigs or test equipment were replaced. About 30 or 40 of the Soviet technicians worked at one time with the Germans. Some 30 of the total of 70 or 80, who eventually completed the training, had been seen before in Germany in the V-2 component collection program. From time to time four or five would leave after they had been trained, and they often covertly intimated that they were to go to Kuybyshev where they expected the Germans would join them. It was generally thought that they would be engaged in setting up facilities for the series production of V-2 weapons. Early in 1947 an assembly line for the thrust units was assembled from German parts in the assembly area adjacent to the General Mechanical Workshop. Soviet workers did this work under Ings. KNITTEL, HENNING, and myself, with HENNING acting as chief. This assembly line consisted of scaffolding and workbenches about 20 meters long. At each of the 15 work

50X1-HUM

50X1-HUM

C O N F I D E N T I A L

C O N F I D E N T I A L

- 2 -

50X1

stations was a cast iron base plate with a smooth and level surface upon which the lower end of the combustion chamber could be held in exact position while parts were assembled on it. An overhead traveling crane was used to pick up the units and move them from station to station. It was completed within a few weeks and was tested by building a few units with it, and it was then dismantled and shipped away presumably to Kuybyshev.

THRUST IMPROVEMENT OF THE V-2 MISSILE THRUST UNIT

2. In August 1947 the work of improving the performance of the thrust unit began. The Soviets gave the group of seven Germans the task of increasing the range and thrust of the unit by whatever means they could devise. The Germans went about this task somewhat as a committee under the leadership of Dipl. Ing. EISELER. The highest ranking man, Dr. Ing. PUTZE, knew nothing of V-2 manufacture and stayed in his office. The ideas were formulated by the group as a whole, and I cannot identify any particular idea with any one individual. The first attempt at improvement was to double the hydrogen peroxide tank capacity by installing a second tank diametrically opposite from the original. This tank was taken from the stock of 500 to 600 tanks brought from Germany. The valves were removed and a cross-connecting tube of about 30 millimeters diameter was welded in and connected to the original. This increased the hydrogen peroxide capacity to about 450 - 500 liters. The Soviets were noncommittal when they saw this arrangement which was only set up in a provisional way with tack welds. The Soviets wanted further improvements especially to increase the range. In order to accomplish this, it was planned to shorten the turbine and accessory section so that the main fuel tanks could be lengthened. To do this the two hydrogen peroxide tanks were eliminated and a torus-shaped tank with an outer diameter almost as great as the rocket body at that point was substituted. This allowed shortening of the turbine and accessory section by about 80 to 90 cm., and a corresponding lengthening of the main fuel tanks. I have no exact information on how much larger the tanks would be. In the shortening process, valves and control lines were relocated and the number of air bottles was increased from eight in one group to two groups of seven each. [See page 6]. The 18 oxygen lines to the injection cups were made in two sections instead of one. The lower sections were made with spiral loops to allow flexibility and were made all alike to allow interchangeability. The upper section was made to allow for the different position of each cup and the different distance to the oxygen pump outlet. It was thought that this upper section would not require frequent replacement since all of the play would be absorbed by the loop in the lower section. The increased thrust that the Soviets desired was to be obtained by increasing the flow of fuel to the combustion chamber by running the turbine faster. Ing. KNACK had the responsibility of increasing pump output. Consequently I have only vague ideas of the actual improvement in performance. As far as I know the pumps and turbines themselves were not changed at all. Only the valves and orifices were changed and the pressure in the air bottles increased an unspecified amount. In spite of the increased flow rate through the fuel pump, the burning time was supposed to be increased to 90 seconds. I am sure that many 35-ton thrust units burned for 90 seconds on the test stand, but cannot say how the increased amount of fuel required would be obtained except for the increased length of tanks made possible by the shortening of the turbine and accessory section. I did not see the inconsistency in the 50 per cent increase in burning time, plus a

C O N F I D E N T I A L

C O N F I D E N T I A L

- 3 -

50X1

40 per cent increase in thrust and the relatively small increase in fuel capacity made possible by the shortening of the turbine and accessory section. Since no work on the rest of the V-2 was done at Zavod 456, I did not hear of any changes in the body or tanks.

3. A pump and turbine test stand were assembled from parts from Germany by Ing. KNACK during the first eight or ten months of 1947. I worked in the Design Office on plans for a better model to use electrically operated valves in the pipes leading to the pumps and turbines. This, like the original, tested the pumps by using them to recirculate water. The Soviets wanted the new one built outdoors near the test stands for thrust units. The drawings for this new test stand were complete in every detail, but no components had been constructed by the time I left the USSR. When a model of the 35-ton thrust unit with all the improvements had been assembled on a provisional basis, the Soviets took it over and began to make production drawings.

TESTING OF V-2 THRUST UNITS

4. While the improvements of the thrust unit were being accomplished, the Soviets continued with the assembly of 25-ton units and had completed about 100 by November 1947. At that time the Soviets began to modify parts for the improved model and attained a production rate of 15 to 20 per month by the middle of 1948. As soon as the thrust unit test stand was finished (sometime in the fall of 1947) the firing tests, sometimes two or three per day, began and continued throughout my stay in the USSR. I witnessed about 15 tests between November 1947 and 15 August 1948 on occasions when I had work which brought me to the test stand area. Of the 35-ton units tested, I never heard of any that exceeded 35 tons by more than 1 or 1-1/2 tons. I did not observe the instruments.
5. Units that passed the test successfully were returned to the workshop where new turbine units were installed to put them in running order again, and then were shipped out, presumably to Kuybyshev. In general, the 35-ton design lived up to expectations, although it went through the normal teething difficulties. I can give nothing definite about these difficulties, except that often they involved the film of fuel used to cool the combustion chamber inner wall. No changes were made in the combustion chamber of the 25-ton unit for use in the 35-ton model, except for a reinforcement of the head of spoke-wise ribs 3 x 8 millimeter externally mounted between the injector cups. The same strengthening was to be accomplished in the model for USSR production by adding radial strips about three inches long welded to the top of the inner skin between injector cups. I remember no changes in the film cooling injection system or regenerative cooling of the nozzle.

TESTING OF MATERIALS

6. After the 35-ton model was turned over to the Soviets for production, the group of Germans broke up and various members went to various parts of the plant. KLIPPEL went to the plant office to work on design of jigs for 35-ton unit production. KNITTEL and SCHIERHORN went to the welding shop to work on welding

50X1-HUM

C O N F I D E N T I A L

C O N F I D E N T I A L

- 4 -

50X1

problems in the construction of 35-ton combustion chambers. I began work on the development of test benches for valves, pressure reducers and solenoid operated components of the flow control system, and other components. I wrote out instructions for operating these test benches and these were reproduced in both German and Russian and placed under glass on the benches. While I was very familiar with the components and with the method for seeing that they met specifications at the time, I was concerned only with this phase, and when they were ready for final assembly I had no more to do with them. Consequently my understanding of how the entire fuel flow control system operated was very limited. At any rate I can give no idea now of how it is supposed to operate. I supervised the testing of many welded samples of the Soviet materials which had to be substituted for German materials. For each part the Soviets were able to specify a suitable Soviet material and welding technique. They worked out a new welding process for the combustion chamber which SCHIERHORN thought was a decided improvement. I can give no details of this process nor give the advantages. I cannot remember any of the Soviet designations for materials.

DEVELOPMENT OF A 100-TON THRUST UNIT

7. [] the group had to leave the Special Development Department because the Soviets wanted to use the area for the construction of a 100-ton thrust unit, the design of which GERHART and BAUM had worked on during 1947 and part of 1948. The design was based on an original German concept. I saw these drawings and can say only that the upper part of the combustion chamber was spherical instead of being flattened as in the case of the 25-ton design. No Germans worked on the actual parts. A test stand for the 100-ton unit was also built by the Soviets. It was a scaled-up model of German test stands for the 25-ton units. It was not finished when the Germans left Khimki. I believe it might have been finished by the end of 1950. 50X1-HUM

ASSEMBLY OF V-1 MISSILES

8. At the same time that the Special Development Workshop was closed to Germans, the assembly area of the General Mechanical Workshop was also placed off limits. This area, which had also been used for the erection and testing of the V-2 thrust unit assembly line equipment, had been used exclusively by Soviet workers from the beginning of 1947 for the assembly of V-1 weapons from German parts. I knew of no modifications of this weapon, nor did I know why the Soviets wanted to keep German personnel out [] 50X1-HUM

MISCELLANEOUS PROJECTS IN THE DESIGN OFFICE

9. [] I joined [] Germans in the Design Office where I remained until the German group left Khimki in [] 50X1-HUM
[] There I made drawings of about ten valves to Soviet specifications including an angle valve for a test stand of unknown use. The other valves were for unknown uses. 50X1-HUM

C O N F I D E N T I A L

C O N F I D E N T I A L

- 5 -

50X1

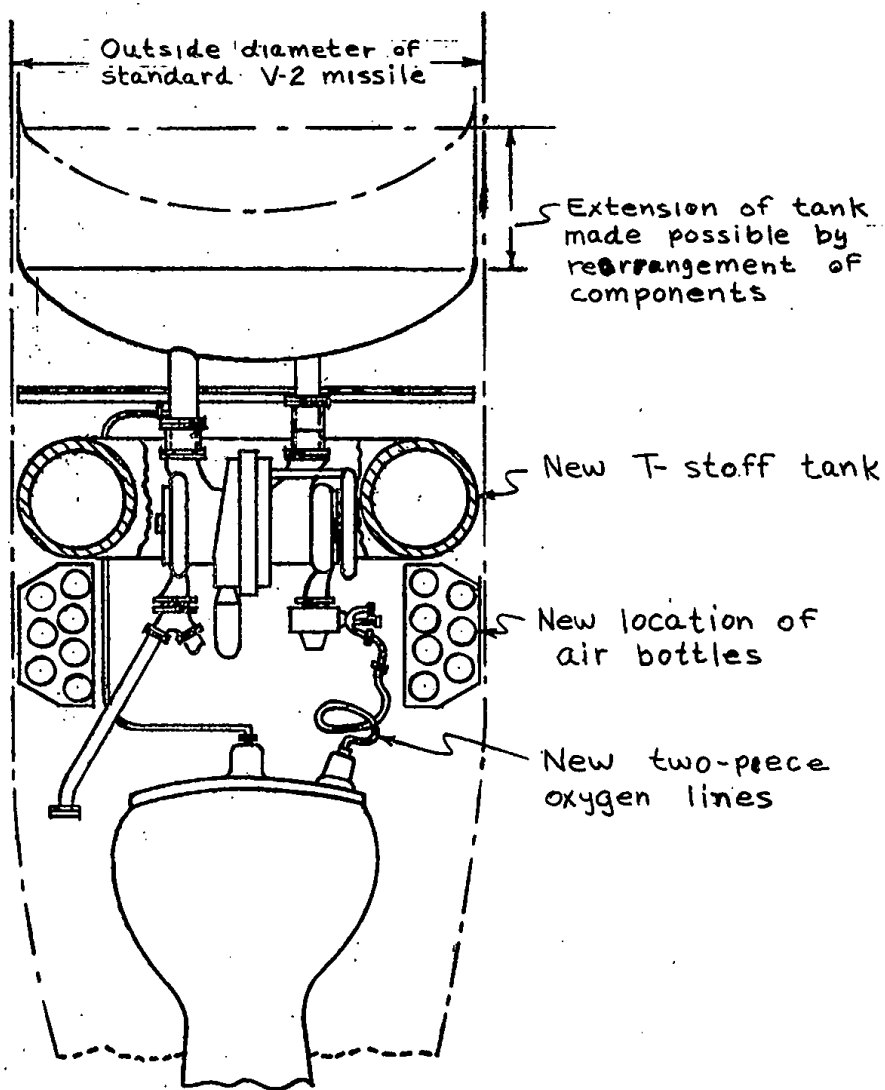
10. I also worked on the design of a 5-ton crane for the workshop, a fatigue testing device, a test stand for V-2 valves and pump seals (this device tested all seals for leaks at temperatures from +40°C to -40°C), and a weighing device for weighing fuel containers at the firing test stands. Four of the latter were made from my designs. Each consisted of a large container which would hold six to eight tons of alcohol mounted on a hydraulic weighing capsule. I also made jigs for welding combustion chambers and for machining the fuel and oxygen valves. These were to replace the ones that were missing from those collected in Germany. The welding jigs were clamping devices with a tiltable circular table capable of being rotated with a hand crank, so that a welder could have a horizontal surface upon which to work. All manufacturing processes were identical to the original German ones except for the improved welding process mentioned previously. The Soviets used German arc welding equipment and coated rods which were smeared with a flux paste (possibly borax) as they were used. When the German rods were used up, the Soviets were able to obtain suitable substitutes among their own types of rods.

C O N F I D E N T I A L

CONFIDENTIAL

Page 6

50X1



MODIFICATION OF V-2 THRUST UNITS
(Not to scale)

CONFIDENTIAL